2/9/18 "An eye for an eye only ends up making the whole world blind."-Gandhi

HW: "More Practice with Vertex Form of a Parabola" #1-15 odd
Test 1 on Thursday 2/15

AIM: What is the vertex form of a Parabola?

Warm Up:

1) Determine if the following function is ~~even~~, odd, or neither.

$$g(x) = x^3 - 4x^1.$$

$$g(-x) = (-x)^3 - 4(-x)$$
$$= -x^3 + 4x$$
$$= -(x^3 - 4x)$$

EVEN AND ODD FUNCTIONS
COMMON CORE ALGEBRA II HOMEWORK

FLUENCY

1. Given the partially filled out table below for $f(x)$, fill out the rest of it based on the function type.

(a) Even

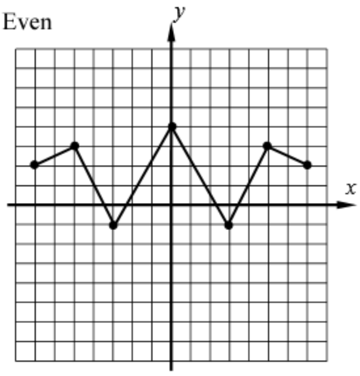
x	-3	-2	-1	0	1	2	3
y	5	**-4**	-7	4	**-7**	-4	**5**

(b) Odd

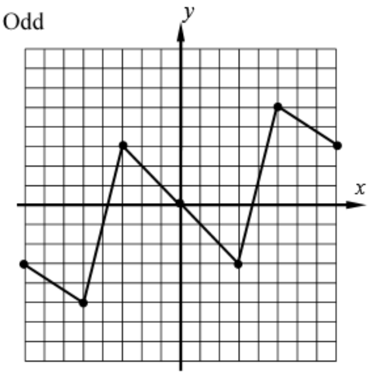
x	-3	-2	-1	0	1	2	3
y	5	**4**	-7	0	**7**	-4	**-5**

2. Half of the graph of $f(x)$ is shown below. Sketch the other half based on the function type.

(a) Even



(b) Odd



3. If $f(x)$ is an even function and $f(3)=5$ then what is the value of $4f(3)+2f(-3)$?

(1) 30 (3) 10

(2) 60 (4) 6

$\mathbf{4f(3)+2f(-3)=4(5)+2(5)}$
$\mathbf{=20+10=30}$

(1)

4. If $g(x)$ is an odd, one-to-one function and if $g(7)=-2$, then which of the following points *must* lie on the graph of the inverse of $g(x)$, $g^{-1}(x)$. Explain how you made your choice.

(1) $(-7, 2)$ (3) $(2, 7)$

(2) $(2, -7)$ (4) $(7, -2)$

$\mathbf{g(-7)=2}$ **because** $\mathbf{g(x)}$ **is odd**
$\mathbf{g^{-1}(2)=-7 \Rightarrow (2,-7)}$

(2)

5. Which of the following functions is even? Explain how you arrived at your choice.

(1) $y = x^2 - 4x$ (3) $y = 9 - x^2$

(2) $y = |x - 6|$ (4) $y = 4^x$

There are many ways to arrive at this choice. For example, you could try to opposite inputs, such as $x = -1$ and $x = 1$. Or you could graph each choice to see which is symmetric about the y-axis.

(3)

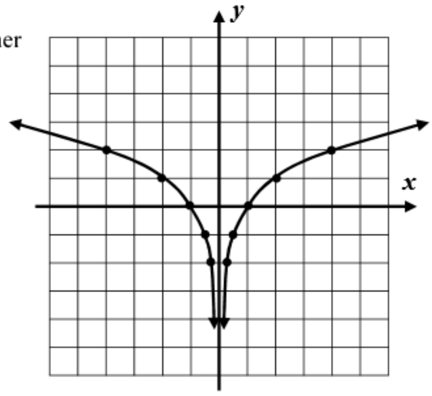
6. The function $f(x) = \dfrac{4x^2 + 2}{x}$ is either even or odd. Determine which by exploring the function using tables on your calculator. Provide evidence for your final choice.

x	-4	-3	-2	-1	0	1	2	3	4
y	-16.5	-12.667	-9	-6	Error	6	9	12.667	16.5

This is an odd function. Each pair of opposite inputs have opposite outputs.

7. Generally, logarithms are not defined for negative inputs. This obstacle can be overcome by composing a logarithm function with an absolute value function. Consider the function $f(x) = \log_2 |x|$.

(a) If the graph of $y = \log_2(x)$ is shown below, sketch the other half of f.



Since $f(x) = \log_2 |x|$ we find th $f(-2) = \log_2 |-2| = \log_2(2) = 1$, and likewise for $f(-4) = \log_2 |-4| = \log_2(4) = 2$.

(b) What type of function is $f(x)$?

This is a great example of an even function. Because the first thing done to the input is taking the absolute value, it treats positive and negative inputs the same.

REASONING

8. You may have noticed that every odd function that we drew that was defined at $x = 0$ passed through the origin, $(0, 0)$. Why must this always be true?

Odd functions must have symmetry with respect to the origin, meaning you can rotate the graph 180° around the origin and it will land on itself. But, that means, that if there was an odd function that contained the point $(0, 10)$, it would also have to contain the point $(0, -10)$ due to symmetry. But, then it would not be a function at all.

9. Even functions have symmetry across the y-axis. Odd function have symmetry across the origin. Can a function have symmetry across the x-axis? Why or why not?

No, a function cannot have symmetry across the x-axis. This is because it would then not be a function. For example, say a function contained the point $(5, 8)$, then if it was symmetric across the x-axis, it would also contain the point $(5, -8)$, which would then mean the function would have two outputs for an input of $x = 5$.

Place each of the following quadratic functions in vertex form and identify the turning point.

Vertex Form

$y = (x-h)^2 + k$

(h, k) - vertex (turning point)

1. $y = x^2 - 8x + 18$.

$y = \underbrace{x^2 - 8x + \boxed{16}} + 18 - \boxed{16}$

$\frac{-8}{2} = -4$

$(-4)^2 = 16$

$\boxed{y = (x-4)^2 + 2}$

Vertex: $(4, 2)$

2. $y = 3x^2 + 12x - 2$

$$\frac{y}{3} = \frac{3x^2}{3} + \frac{12x}{3} \quad - \frac{2}{3}$$

$$\frac{y}{3} = x^2 + 4x + \boxed{4} - \frac{2}{3} - \boxed{4}$$

$$\frac{4}{2} = 2$$

$$2^2 = 4$$

$$3\left(\frac{y}{3} = (x+2)^2 - \frac{14}{3}\right)$$

$$\boxed{y = 3(x+2)^2 - 14}$$

Vertex: $(-2, -14)$

3. $y = 2x^2 + 6x + 1$

HW check:

1) $y = x^2 + 6x + \boxed{9} \underbrace{+ 9 - \boxed{9}}_{0}$

$y = (x+3)^2$

Vertex: $(-3, 0)$

Axis of Symmetry: $x = -3$

Domain: $(-\infty, \infty)$ Range: $[0, \infty)$

Range: * if x^2 is positive
range is from y-value of vertex
to ∞.

~~Range~~

* If $-x^2$ then range will
be from $-\infty$ to the y-value of vertex

3) $y = \underbrace{x^2 + 6x + 9}\ \underbrace{+10 - 9}_{1}$

$\frac{6}{2} = 3$

$3^2 = 9$

$\boxed{y = (x+3)^2 + 1}$

Vertex: $(-3, 1)$ A.of S.: $x = -3$

Domain: $(-\infty, \infty)$ Range: $[1, \infty)$

5) $y = \underbrace{x^2 - 2x + 1}\ \underbrace{-5 - 1}$

$y = (x-1)^2 - 6$

Vertex: $(1, -6)$ Domain: $(-\infty, \infty)$

A of S: $x = 1$ Range: $[-6, \infty)$

7) $y = \underbrace{x^2 + 16x + 64}\ + 71 - 64$

$y = (x+8)^2 + 7$

V: $(-8, 7)$

AofS: $x = -8$

D: $(-\infty, \infty)$

R: $[7, \infty)$

9) $\frac{y}{2} = \frac{2x^2}{2} + \frac{4x}{2} + \frac{5}{2}$

$\frac{y}{2} = \underbrace{x^2 + 2x + 1}\ \underbrace{+ \frac{5}{2} - 1}_{\frac{3}{2}}$

$2\left(\frac{y}{2} = (x+1)^2 + \frac{3}{2}\right)$

$y = 2(x+1)^2 + 3$

V: $(-1, 3)$

AofS: $x = -1$

D: $(-\infty, \infty)$

R: $[3, \infty)$

11) $\frac{y}{2} = \frac{2x^2}{2} + \frac{36x}{2} + \frac{120}{2}$

$\frac{y}{2} = x^2 + 18x + \boxed{81} + 85 - \boxed{81}$

$2\left(\frac{y}{2} = (x+9)^2 + 4\right)$

$y = 2(x+9)^2 + 8$

V: $(-9, 8)$ D: $(-\infty, \infty)$

AofS: $x = -9$ R: $[8, \infty)$

13) $\frac{y}{3} = \frac{3x^2}{3} + \frac{6x}{3} + \frac{8}{3}$

$\frac{y}{3} = x^2 + 2x + 1 + \frac{8}{3} - 1$

$3\left(\frac{y}{3} = (x+1)^2 + \frac{5}{3}\right)$

$y = 3(x+1)^2 + 5$

V: $(-1, 5)$ AofS: $x = -1$

D: $(-\infty, \infty)$ R: $[5, \infty)$

15) $y = (x+5)(x+4)$

$y = \underbrace{x^2 + 9x + \frac{81}{4}} + 20 - \frac{81}{4}$

$\frac{9}{2} = \frac{9}{2}$

$\left(\frac{9}{2}\right)^2 = \frac{81}{4}$ $\quad y = \left(x + \frac{9}{2}\right)^2 - \frac{1}{4}$

Vertex: $\left(-\frac{9}{2}, -\frac{1}{4}\right)$ D: $(-\infty, \infty)$

a of S: $x = -\frac{9}{2}$ R: $\left[-\frac{1}{4}, \infty\right)$